

# ACTIVITY 5 GRADES 9-12

## Objective

Students will perform a controlled experiment to determine what plants use allelopathy to boost their chances of success.

## Time Suggestion

One class period for setup, 5 minutes per day for 3 weeks.

## Wisconsin Model Environmental Education and Science Standards

**Environmental Education:** A.8.2, A.8.4, A.12.4.

**Science:** 1.8.6, C.8.1-7, C.8.11, C.12.1, C.12.3, F.8.8, F.12.7.

## HEY YOU! GET OFF OF MY GROUND!\*

### DESCRIPTION

Students test for the effect of plant extracts on the germination of seeds.

### PROBLEM

Does purple loosestrife produce chemicals that repel or kill other plants?

### MATERIALS

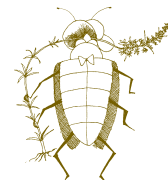
- ☐ Analytical balance.
- ☐ Fresh or dried plant material (preferably fresh): quack grass (*Elytrigia repens*, roots and rhizomes), jimson-weed (*Datura stramonium*, roots), ragweed (*Ambrosia artimisiifolia*, roots), Canadian horseweed (*Conyza canadensis*, leaves), black walnut (*Juglans nigra*, leaves), common buckthorn (*Rhamnus cathartica*, leaves), purple loosestrife (leaves or roots).
- ☐ Per small group, 2 petri dishes.
- ☐ Box of filter paper or roll of paper towels.
- ☐ Distilled water.
- ☐ Per small group, 10 radish (or other fast germinating) seeds.
- ☐ Per small group, 15-cm ruler.
- ☐ Mortar and pestle.
- ☐ Pipettes.

### PROCEDURES

Direct students to do the following 4 steps:

1. Weigh 10 grams or more of plant material. Add 100 mL of distilled water and grind the material of each separate kind of plant using a mortar and pestle. The mixture should be very dense and pasty. If it is too thin, add a small amount of plant material, carefully noting the mass of plant material added. Stir the mixture several times in the course of the day; it can be used the next day.
2. Assign one of the plant mixtures to each group, and have each group label one petri dish with the name of its plant and one with "water." Then place 5 radish seeds on a folded paper towel in the bottom of each petri dish. Measure enough plant





## ACTIVITY 5 HEY YOU! GET OFF F MY GROUND! (CONTINUED)

extract onto one paper towel to soak it. Put water on the other. Be sure the plant extract used on the seeds matches the petri dish label. Place lids on each dish and place in the dark. Check periodically and water with extract or hot water, keeping the amount of extract used the same for all the petri dishes.

3. Record germination dates. Record the radicle and hypocotyl growth daily for approximately 5 days. Record qualitative information about the seeds. Chart qualitative results.
4. Calculate means and graph or chart quantitative results. Ask students to discuss their results and draw conclusions.

Have students view the data collected by the rest of the class and evaluate the presence or absence of allelopathy in the species that were tested. Conclude together whether purple loosestrife exhibits allelopathy.

### BACKGROUND INFORMATION

Some plants produce chemicals that are harmful to other plants. This is called allelopathy. It often allows a plant to escape competition from other plants for water, soil nutrients, light, pollinators, etc. Allelopathy is most often seen where a habitat is crowded with plants needing the same resources.

The chemicals can act in different ways, such as retarding other plants' seed germination, slowing their growth, or even poisoning them. The varied plants listed in the materials section are all examples of allelopathic species, except purple loosestrife—maybe. Actually, since purple loosestrife can take over a wetland so quickly, some scientists have wondered if it uses allelopathy to get ahead of its neighbors. This study gives students a chance to test just that!

### STUDENT ASSESSMENT

Have students create a written lab report with a summary of results and their implications for wetlands and purple loosestrife. Combine allelopathic information with other information on the biotic potential of purple loosestrife (see Activity 1, page 1). Measure that against any known environmental resistance. Suggest what can be done.

### EXTENSIONS

Try other allelopathic interactions. For example, use double-sided tape to stick a horseweed leaf inside of the top of a petri dish, out of contact with water, paper towel, or seeds. Note effects.

Try using the various extracts to water mature plants.

Go on-line and find the results of other scientists' investigations into allelopathic interactions.

Have students create a visual representation of their findings.



WISCONSIN DNR

\* Revised with permission from "What's Wetland Allelopathy?" in *The Purple Loosestrife Project Cooperator's Handbook*.